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Executive Summary

Latvia is a **small country** with a population of around 2 million. The GDP per capita in PPS in 2009-2010 made up only 51% of the EU-27 average. While the annual growth rate of GDP in 2006 was 12.2%, under the conditions of economic recession it fell to minus 17.7% in 2009, and minus 0.3% in 2010, starting to recover only in 2011 (estimated growth of 4-5%). The Innovation Union Scoreboard 2010 recurrently identifies Latvia as a **modest innovator**. Its Summary Innovation Index score (0.201) is still significantly below the EU average (0.516) and despite the relative progress made in 2006-2009 it positions Latvia the very last among all EU countries.

The national **trends in research and innovation funding** demonstrate rather notable fluctuations with regard to GERD, which, under the crisis conditions, witnessed a drop from 0.61% of GDP in 2008 to 0.46% in 2009, thereby making up only 30% of the EU-27 average. While GERD demonstrated certain recovery in 2010, it can mainly be attributed to the allocations from the EU SFs. Currently Latvia no longer adheres to the GERD target of 3% of GDP by 2020 – the National Reform Programme of Latvia (2011) has lowered it to mere 1.5%, instead. The contribution for science from the national budget in absolute figures has continued to decline from €38m in 2009 to €29m in 2010 (€67m in 2008) with no notable change in 2011. Whereas in 2008 the main contribution to GERD still came from the government sector, in 2010 the shares of GERD by sources of funds have shifted to reflect an increased importance of R&D funding coming from companies and foreign funds. The main **research performer** groups in Latvia are represented by higher education institutions and their research institutes as well as independent state research institutes with certain research activities undertaken also by commercial companies.

The central organisation in the Latvian **R&D policy** is the Ministry of Education and Science. In its turn, the Ministry of Economics holds prime responsibility for **innovation policy** and exerts influence on the research domain mainly through selected innovation policy measures. Yet, the Declaration of the intended activities of the new Cabinet of Ministers signed in November 2011 envisages bringing innovation policy under control of the Ministry of Science and Education. On the political level, a new national authority, namely, the Prime Minister's Cross-sectoral Coordination centre has been set up in 2011 to coordinate the national development planning.

The current report identifies the following four key structural challenges **of the national RTDI system of Latvia:**

Unstable R&D funding and governance system. The national R&D funding in Latvia has demonstrated rather notable fluctuations over the last decade, at a comparatively low general reference level. The annual allocations of state budget funding for R&D have so far been inconsequent and highly dependent on the economic performance of the country with low commitment of the government under conditions of tight national budget. In recent years public funding for R&D has become excessively dependent on EU SFs, which is a questionable approach in a long-term perspective. The national governance system has not been conductive enough to securing and maintaining the strategic role of R&D and innovation in the social and economic development of the country.

Limited innovative capacity of the enterprise sector. The current business structure of Latvia is composed mainly of small- and medium-sized enterprises and only a few of the existing industrial enterprises prove to be internationally competitive

in the high-tech field. Latvia has been recurrently enlisted among the EU countries with the lowest level of innovation performance. The service sector as the dominant one in Latvia currently demonstrates low innovative capacity, while the industrial sector is undersized to make a significant contribution in terms of the national innovation performance.

Insufficient supply and sustainability of skilled labour force. The problem with the supply of qualified labour force has become particularly acute under the conditions of major outmigration of the Latvian population. The current set-up of the research and academic staff in Latvia is in need of rejuvenation in terms of both quantity and quality. The main shortage can be observed in the business enterprise sector where only 16% of all researchers are employed. There is an overall lack of entrepreneurs, in technology-intensive branches in particular. The number of R&D staff in Latvia has witnessed a decrease during the crisis years since the level of remuneration of researchers does not act a strong attraction factor for pursuing ones carrier in science for both nationals and foreigners. So far there have also been limited incentives in notably boosting the quality of research at PROs.

Underdeveloped and weakly motivated intra- and intersectoral collaborative practices. There are weak collaborative practices in the domains or domestic intersectoral knowledge/technology transfer, integration of universities and institutes, as well as intrasectoral and cross-border S&T cooperation. This challenge largely results from the above-mentioned challenges related to the limited innovative capacity of the business enterprise sector and the insufficient supply and sustainability of skilled labour force that both limit the possibilities for collaboration. This challenge can also be more generally linked with the low level of interpersonal trust, with strong implications for the economic and political development of the country.

The external evaluation of the national RTDI policy carried out in 2009 concluded that Latvia needs significant reforms in order to promote development of the national innovation system. While the elaboration of a multi-annual RTDI strategy was started in Latvia in the mid-2000s, over recent years some further attempts have been made to reconsider the **national research and innovation priorities** in the light of the current economic situation. The National Reform Programme sets the following priorities in the R&D domain: advancement of the potential of scientific activity; development of a long-term cooperation platform for enterprises and scientists; support to development of innovative enterprises. This policy orientation thus tends to place greater emphasis on the academia-industry relations and the role of the enterprise sector. Since 2005, one of the strategic elements used in the national research policy is also represented by the prioritisation of scientific branches, with a new set of five thematic priorities approved for 2010-2013.

In the light of the **ERA pillars** the national policy mix is to a varying degree aligned with the diverse objectives of this endeavour. Many of these objectives are addressed, though with variable rate of success, with support of the EU SFs. This is particularly the case with those objectives aimed at ensuring an adequate supply of human resources for research, development of research infrastructure, as well as facilitation of partnerships and productive interactions between research institutions and the private sector. Policy efforts are also increasingly targeted at enhancing knowledge circulation across Europe and strengthening international cooperation in science and technology. Yet, it still remains a challenge to address such objectives

as the openness and the attractiveness of the national R&D system for cross-border flows of funding and human resources.

The **existing policy mix** in Latvia is targeted toward improving the integration of the innovation and R&D system and horizontal coordination within it. The EU SFs are used to strengthen the innovation support system and there is increased funding for R&D, also in the business sector. Much closer cooperation between public research sector and business sector is being encouraged, but much more has to be done to increase the impact of the input made by the R&D sector on the innovation process. To this end, it is also very important that the current government pledges to develop industrial sector and strengthen the linkage with higher education and applied science. As regards R&D specific and innovation financing policies, the annual volumes of many support measures remain rather insignificant that so far have not been very conductive for efficiently addressing the major structural challenges. Yet certain policy trends featuring positive developments over the review period can be identified with regard to selected newly launched support measures. Besides, in April 2011, the Government made a decision about carrying out an additional in-depth evaluation of the implementation of research and innovation policy in 2012.

Considering the **possible directions for the evolution of the current policy mix**, the bulk of the national RDI policy measures in Latvia by 2020 is likely to remain focused on R&D specific financial policy, based on EU SFs in particular. These funds should be mainly channelled for providing support to development of innovative enterprises by means of placing company innovation to the centre of research and innovation policy and facilitating long-term cooperation between enterprises and scientists. It is crucial to alter the principles for the allocation of state science budget by giving priority to research relating to the thematic priorities in a systematic way. In addition, concrete efforts are to be made for ensuring further rejuvenation and expansion of the research and academic staff as well as enhanced contacts and networking with the Latvian industrial and research diaspora, int. al. to facilitate partial return of expatriates. This could be notably encouraged if 3-4 national research centres would be advanced towards becoming world class centres of excellence in terms of research infrastructure, staff competencies and remuneration.

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1 Introduction

According to Eurostat[1], Latvia has a total population of 2.2 million[2], featuring a constant decrease of population since 1990 and in 2011 accounting for only 0.44% of the EU-27 population. While Latvia's gross domestic product (GDP) per capita in purchasing power standards (PPS) by 2008 had reached 56% of the EU-27 average with GDP having grown at a rate of over 10% since 2005, due to the harsh economic recession in both 2009 and 2010 it had fallen back to 51% of the EU-27 average, featuring the real GDP growth rate of -3.3 (2008), -17.7 (2009) and -0.3 (2010). This decline has been accompanied by a drop in the total employment rate from 68.6% in 2008 to 59.3% in 2010 (against the EU-27 average of 64.1%). Yet, by September 2011 the unemployment rate had decreased to 14.4% from the high annual average level of 18.7% present in 2010 (7.5% in 2008). Also the estimated GDP growth in 2011 is expected to reach 4-5%, thereby marking a resumed upward trend.

Notable fluctuations could also be observed with regard to the gross domestic expenditure on research and development (GERD), which witnessed a drop from 0.61% of GDP in 2008 to 0.46% in 2009, thereby making up only 30% of the EU-27 average (2.01% of GDP). In 2010, GERD demonstrated certain recovery to 0.60% (CSB, 2011), yet mainly due to the allocations from the EU SFs that can be expected to provide an additional input also in 2011. Simultaneously the contribution for science from the national budget in absolute figures has continued to decline from €38m in 2009 to €29m in 2010 (€67m in 2008). Whereas in 2008 the main contribution to GERD still came from the government sector (47%), in 2010 the shares of GERD by sources of funds were as follows: government sector – 26% (€28.9m), higher education (HE) sector – 1% (€1.6m), business enterprise sector – 39% (€42.5m), and abroad – 33% (€36.6). This redistribution points to the increased importance of R&D funding coming from companies and foreign funds (EU SFs) (an increase by 12% and 10% respectively). For comparison, in 2009 the EU-27 average featured a major (54%) contribution from the business enterprise sector with 35% coming from the government sector and only 8% from abroad (see also section 3.1).

While the Summary Innovation Index of the Innovation Union Scoreboard shows a slight improvement for Latvia from 0.195 in 2009 (2006 – 0.163) to 0.201 in 2010, the country is still enlisted among the least performing modest innovators with its **innovation performance** well below the EU-27 average (0.516) (IUS 2011: 71). Latvia demonstrates extremely low number of publications in internationally peer-reviewed academic journals, and, like other CEE countries, it also features low levels of applications to the European Patent Office. Both indices hardly reach 25% of the EU average.

According to Eurostat, in 2010, the total **GBAORD** as a percentage of total general government expenditure made up only 0.51% (0.83% in 2007) in comparison to the EU-27 average of 1.5%. The breakdown of GBAORD by socio-economic objectives reveals that while in Latvia the prime socio-economic objective was represented by 'General advancement of knowledge: R&D financed from other sources than general

[1] If not indicated otherwise, all figures are based on the Eurostat data available at http://epp.eurostat.ec.europa.eu/

[2] Independent researchers and the provisional results of the population census carried out in 2011 estimate that that the total number is around 2 million.

university funds' (30.7%), other considerable objectives include 'Health' (12.4%), 'Industrial production and technology' (12.1%), 'Energy' (9.2%), 'Transport, telecommunication and other infrastructures' (9.0%) and 'Agriculture' (8.6%). All this expenditure is almost exclusively (99.7%) made up of civil R&D appropriations. Over the last five-six years the prioritisation of various sectors of the economy has generally emerged as one of the tools for pursuing specific knowledge demand by the Latvian government (for elaboration and implementation of corresponding national research programmes). The following priorities have been approved for the years 2010-2013 (CoM, 2009b): Energy and the environment; Innovative materials and technologies; National identity; Public health; Sustainable use of local resources.

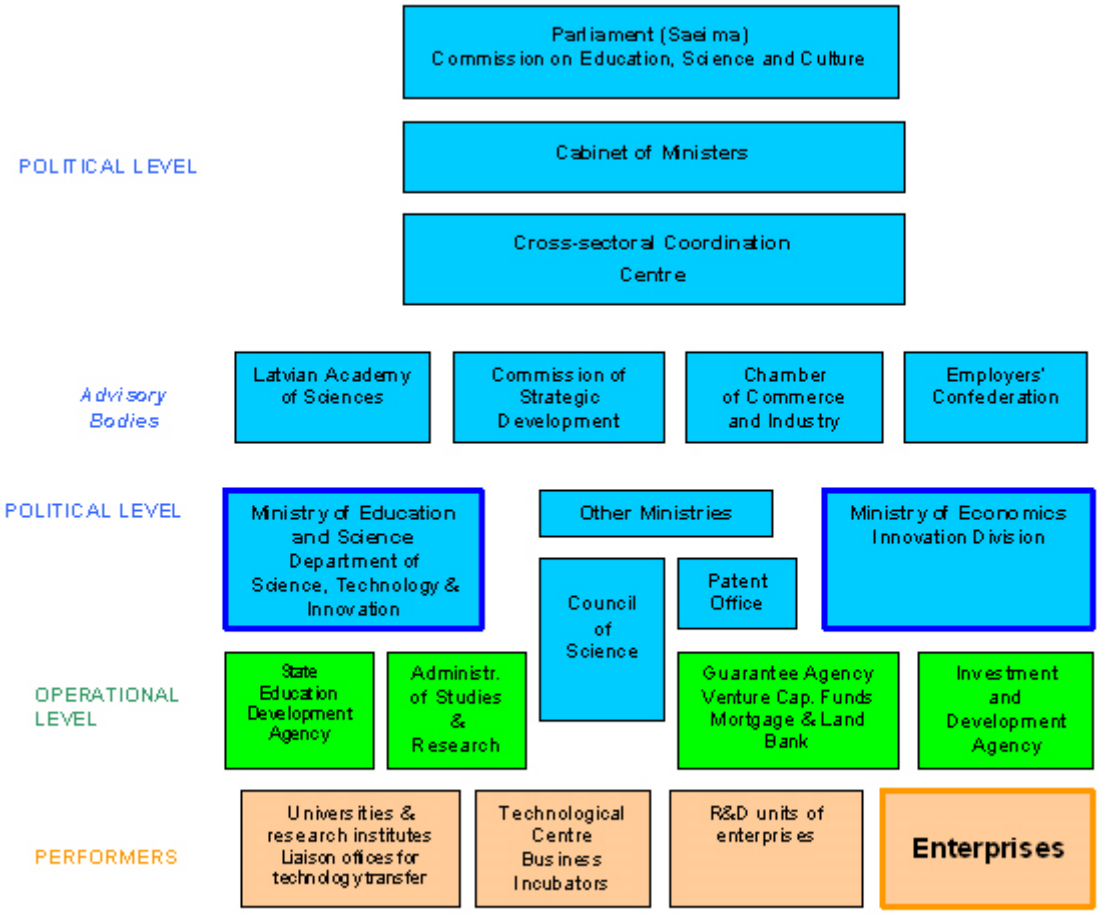
R&D **specialisation patterns and expenditures** in part correspond to the current specialisation of the national economy. The above-listed national research priorities are interlinked with the priority sectors of national economy (CoM, 2009c) through the recently launched programmes of National research centres and Competence centres (Kristapsons, Draveniece & Adamsone-Fiskovica 2011). The priority sectors of economy have been identified as thrust areas to achieve economic recovery. The research priority "Innovative Materials and Technologies" can be associated with two priority sectors of economy - "Information and communication technologies" and "Production of electric devices and optical appliances"; "Public Health" with "Chemical and pharmaceutical industry"; "Energy and Environment" with "Mechanical engineering and metal working" and "Transport and logistics"; and "Local Resources" with "Forest industry" and "Food industry", respectively. While the national statistics does not provide disaggregate data on the business sector investments for R&D by industrial sectors, indirect indications show that important industries in terms of such investments are represented by pharmacy, information technologies, and electronics – largely in line with the priorities set by the government.

The **governance of the national research and innovation system** can be characterised by the main actors at the political, operational and performing levels (see Figure 1). The central organisation in Latvian R&D policy is the Ministry of Education and Science. In its turn, the Ministry of Economics holds prime responsibility for innovation policy and exerts influence on the research domain mainly through selected innovation policy measures. Yet, the Declaration of the intended activities of the new Cabinet of Ministers signed in November 2011 (CoM, 2011a) envisages transferring the rights to develop the policy of the innovation field to the Ministry of Science and Education. On the political level, a new national authority, namely, the Prime Minister's Cross-sectoral Coordination centre will coordinate and monitor the national development planning, starting from 1 December 2011. In accordance with the decision taken by the Parliament (*Saeima*) on 16 June 2011, the new authority replaces the former National Development Council. This Centre is expected to eliminate the current fragmentation of the development planning practice and the mutually uncoordinated system of development planning documents in Latvia so far weakly linked with the budget planning.

Research and innovation policy in Latvia (a country as a whole categorised as a single region at NUTS I and II levels) is predominantly developed, funded and implemented at the national level, therefore the institutional **role of regions** in research governance is comparatively limited. The existing five planning regions have neither the level of responsibility nor the funding capacity to develop their own explicit R&D policies. While research activities are for the most part concentrated in the capital city, note has to be taken of the growth and strengthening of regional

higher education institutions (HEIs) and development of related research activities. Efforts are also made by the planning regions to integrate R&D and innovation-related issues in their development programmes, strategies and action plans.

Figure1: Organisational structure of Latvian System of Research and Innovation (December 2011)



Source: compiled by the Report authors

The main **research performer groups** in Latvia are represented by HEIs and their affiliated research institutes as well as independent state research institutes with certain research activities undertaken also by commercial companies. According to Eurostat, GERD as a percentage of GDP by sectors of performance in 2010 was as follows: higher education sector (HES): 0.24 (40%), business enterprise sector: 0.22 (37%), and government sector: 0.14 (23%). As regards the affiliation of researchers (3,807 FTE in 2010) by sectors of performance, almost 70% are currently affiliated to HES, 16% - to the business sector and 15% - employed in the government sector.

2 Structural challenges faced by the national system

The following key structural challenges have been identified as currently faced by the national research and innovation system of Latvia.

1. Unstable R&D funding and governance system

The national R&D funding in Latvia has demonstrated rather notable fluctuations over the last decade, at a comparatively low general reference level. The annual allocations of state budget funding for R&D have so far been inconsequent and highly dependent on the economic performance of the country with low commitment of the government under conditions of tight national budget. While the Law on Research Activity (2005) stipulates that state funding shall increase annually by 0.15% of GDP until it reaches 1% of GDP, this provision was put into effect for the first two years. The upsurge of the economic crisis, however, led not only to a halt but even a more than double reduction of public R&D funding. The unsteady R&D intensity growth in Latvia has also been noted by the Innovation Union Competitiveness Report 2011 (EC, 2011a).

While in 2010 GERD reached 0.60% of GDP demonstrating a rise from 0.46% in 2009 (CSB, 2011), this has mainly been achieved on account of the funding inflow from EU SFs. The total EU SF funding earmarked for science in 2007-2013 amounts to €321m, while the state budget funding in the same period can be estimated to reach only €280m. It can be assumed that in 2011-2013 the absolute funding is to remain at the current level or to demonstrate a slight increase. However, an increase as a per cent of GDP can hardly be expected after 2012 given the saturation to be reached by the SF funding by that time. The year 2013 marks the end of the current planning cycle of SFs and, based on the previous experience, it can be assumed that the actual funding will be made available no earlier than two years after the launch of the new cycle. Besides, in the aftermath of the crisis the state budget funding is unlikely to increase substantially in the coming years. Such instability in the provision of R&D funding does not prove to be conductive to any major advancement in the research quality and quantity in Latvia due to the limited opportunities for long-term budget planning by research performers. Overreliance on SFs in R&D and innovation funding should be treated with caution since the related incentives have so far demonstrated limited long-term effects in increasing national innovation capacity, in Central and East European (CEE) countries in particular (Radosevic, 2011: 29-30).

The unsustainability of R&D funding can also be attributed to the overall weakness of the national governance system, with the responsibility for developing R&D and innovation policy divided between several institutions (see also CREST, 2010). So far the national governance system has not led to securing and maintaining the strategic role of R&D in the social and economic development of the country.

2. Limited innovative capacity of the business enterprise sector

Latvia has been recurrently listed among the EU countries with the lowest level of innovation performance. The analysis provided by the Innovation Union Scoreboard notes that Latvia is int. al. characterised by weak funding and participation of industry in R&D (IUS, 2011: 138). While there has been a recent upward trend with regard to BERD, in 2010 it made up only 37% of all R&D funding in Latvia, thus notably lagging behind the EU average of 61% in 2009. As argued by the Innovation Union

Competitiveness Report 2011, the national economy of Latvia is characterised by limited knowledge capacity and intensity, positioning it among countries of "medium-low knowledge capacity with a strong role of agriculture and low knowledge-intensive services" (EC 2011a: 436).

The current business structure of Latvia is composed mainly of small- and medium-sized enterprises (SMEs) (99.5%) with the strong domination of micro-enterprises (82.5% of all enterprises) (MoE, 2011b: 109). Their low capacity to invest in R&D and innovation is demonstrated by that fact that SMEs introducing product or process innovations in Latvia make up only 17% of all SMEs, while the respective share in the EU-27 on average is 34% (IUS, 2011: 61). As summarised by the Global Competitiveness index, Latvia is still in the transition from "*Efficiency driven*" to "*Innovation driven*" economy (GCR, 2011). Also the EC report on the Member States (MS) competitiveness performance and policies analysing the long-term changes in the industrial structures of the MSs enlists Latvia in the group of countries that are catching up, but with trade specialisation in technologically less advanced sectors (industry value added in 2009 made up 9.9% in Latvia) (EC, 2011b).

The GDP of Latvia in 2010 made up €18.1b, out of which only 13% were provided by the industrial sector (CSB, 2011). Only a few of the existing industrial enterprises prove to be internationally competitive in the high-tech field (Kalviņš et al. 2010). Similar to the average trends in the EU, the major share of Latvia's GDP (72%) is currently composed by the service sector with a significant role played by the transport/transit services. This sector, however, features limited contribution in terms of innovation: in 2008 it accounted for only 10% of the total innovation expenditure (CSB, 2010: 13). In 2008, R&D (both intramural and extramural) in the service sector amounted to approx. €7m – less than 10% of all R&D expenditures (€85m) (ibid.).

Thus the service sector as the dominant one in Latvia currently demonstrates low innovative capacity, while the industrial sector is undersized to make a significant contribution in terms of the overall innovation performance of the country.

3. Insufficient supply and sustainability of skilled labour force

It has long been argued that the current set-up of the research and academic staff in Latvia is in need of rejuvenation in terms of both quantity and quality. According to the Global Competitiveness Report Latvia is ranked 96th (Lithuania – 57th, Estonia – 62nd) in terms of the availability of scientists and engineers (GCR, 2011). A substantial part of the existing staff (in 2010, R&D personnel made up 5,409 FTE, incl. 3,807 researchers (CSB, 2011)) is beyond 60 years of age and the overall number of researchers per thousand labour force is 3.6 compared to the EU-27 average of 6.3 (EC, 2011a: 138). While a national target has been set to award at least 425 new PhDs annually (MoES, 2009: 23), so far this level has not been reached (2009 – 133; 2010 – 176, 2011 – estimated above 250). The number of new doctorate graduates (ISCED 6) per thousand population aged 25-34 is 0.4 in Latvia compared to the average of 1.4 in the EU-27 (2009) (EC, 2011a: 138). The main shortage of researchers can be observed in the business enterprise sector where only 16% of all researchers (or 22% of all R&D personnel) are employed (CSB, 2011), which is also indicative of the general lack of entrepreneurs, in technology-intensive branches in particular (Kalviņš et al., 2010).

The problem with the supply of qualified labour force has become particularly acute under the conditions of major outmigration of the Latvian population. Recent

research-based estimations show that during the last 11 years (2000-2011) around 200 thousand people have left the country, the majority of which are educated and highly skilled individuals (Hazans, 2011). Out of the total number, 80 thousand people have emigrated just over a two year period (2009-2010) with this sharp increase featuring the direct effects of the recent economic crisis. The number of R&D staff in Latvia has witnessed a decrease during the crisis years (both due to outmigration and change of employment) since the level of remuneration of researchers does not act as a strong attraction factor for pursuing ones carrier in science for both nationals and foreigners (see Annex, sections 1.1-1.2).

The Innovation Union Scoreboard points to the relative weakness of Latvia in the provision of open, excellent and attractive research systems (IUS, 2011). The Global Competitiveness Report ranks Latvia 56th (Estonia – 27th, Lithuania – 37th) by the quality of scientific research institutions (GCR, 2011). So far there have been limited incentives in notably boosting the quality of research at PROs, int. al. based on the applied assessment criteria. For instance, the present threshold of peer-reviewed publications upon the distribution of institutional funding has been set at a rather low level (0.5 publications in the last five years per scientist (FTE)) and this criterion has not been strongly enforced in the allocation of competitive funding either.

4. Underdeveloped and weakly motivated intra- and intersectoral collaborative practices

One of the major structural challenges faced by the national research and innovation system of Latvia has to do with the generally underdeveloped and weakly motivated intra- and intersectoral collaborative practices that are crucial in advancing innovative development. The Global Competitiveness Report ranks Latvia comparatively low in terms of the state of cluster development (94th) and university-industry collaboration in R&D (57th) (GCR, 2011). A survey reveals that in 2006-2009 only 3-7% (against the EU-27 average of 15%-25%) of Latvian enterprises had developed strategic relationships with research institutes and educational institutions to support innovation (Innobarometer, 2009). The Innovation Union Competitiveness Report 2011 mentions Latvia among the countries even having witnessed a decrease in the intensity of contractual R&D collaborations over the period 2000-2008 (EC, 2011a: 201). Latvia is also featured as the only country with domestic (rather than cross-border) FP7 collaborative links ranking first. Research emphasizes the competitive rather than collaborative nature of the business culture in Latvia that also hinders the efforts in pursuing collaborative projects between companies, HEIs and PROs (LASS, 2010).

This challenge largely results from the above-mentioned challenges related to the limited innovative capacity of the business enterprise sector and the insufficient supply and sustainability of skilled labour force that both limit the possibilities for collaboration. The underdevelopment of collaborative practices can also be more generally linked to the low level of interpersonal trust, which is being explained by the historical legacies of the soviet period with strong implications for the economic and political development of the country (Inglehart, 1999; Ostrovska, 2009). It can be argued that these legacies also have an effect on the weak collaborative practices in the domains or domestic intersectoral knowledge/technology transfer, integration of universities and institutes, as well as intrasectoral and cross-border S&T cooperation.

3 Assessment of the national innovation strategy

3.1 National research and innovation priorities

The elaboration of a **multi-annual RTDI strategy** was started in Latvia in the mid-2000s. In 2009, the Guidelines for Development of S&T for 2009-2013 (MoES, 2009) and research priorities (five in total) for the same four-year period were approved by the government. The features of this strategy have been earlier incorporated in the National Development Plan 2007-2013 and the National Strategic Reference Framework (MoF, 2007) where the strengths and weaknesses at national level in the area of human resources and employment, innovation and entrepreneurship as well as infrastructure and services have been analysed. The implementation of this RTDI strategy has been further specified in the Strategic Development Plan of Latvia for 2010-2013, and eventually in the National Reform Programme (NRP) of Latvia for the implementation of the "Europe 2020" strategy adopted in 2011 (MoE, 2011a).

The latter documents demonstrate a certain attempt to reconsider the **priorities of RTDI strategy** in the light of the current economic situation since the Guidelines were elaborated in 2006-2008 prior to the crisis. Namely, the more recent documents tend to place greater emphasis on the academia-industry relations and the role of the enterprise sector. The NRP as the most recent strategy document sets the following priorities with regard to R&D domain (MoE, 2011a): advancement of the potential of scientific activity; development of a long-term cooperation platform for enterprises and scientists; and support to development of innovative enterprises. The said priorities have been selected mainly on the basis of the low share of R&D in GDP, which is explained by the small amount of state budget funding, and an insufficient contribution of the private sector to research (see section 3.2). More specifically, the key underlying challenges to be addressed by the enlisted priorities have been attributed to (1) the small number of employed in science and research (ageing of scientists, insufficient number of doctoral candidates), (2) underdeveloped scientific and research infrastructure (insufficient number of up-to-date equipped laboratories for implementing technology-oriented projects), (3) weak commercialisation potential of research results, poor cooperation between scientific and industrial sectors, and (4) the limited capacity of SMEs as the dominant component of the business structure of Latvia to invest in R&D, and relatively low high-tech sector.

The government, in power from March 2009 until October 2011, saw the development of manufacturing companies and increase in export volumes as a basis for economic recovery[3], and took this approach in distributing the available funds. In the light of this policy orientation **specific business sectors** were identified as high-priority sectors (CoM, 2009c): Information and communication technologies, Production of electric devices and optical appliances, Chemical and pharmaceutical industry, Mechanical engineering and metal working, Transport and logistics, Forest industry, and Food industry. Similar approach has been used in several other governmental decisions, including the NRP. These priorities have been set in parallel

[3] An improvement could be observed in 2010 with import volume only by 21% (41% in 2008) exceeding the export volume, both having increased by 20-23% since 2009.

to the ones identified with regard to scientific development (since 2005; currently for 2010-2013). While a certain level of conformity between the two sets can be observed (see also section 1), a more tangible inter-relationship could be desired. So far this sectoral prioritisation of research and the national economy at large has been carried out rather independently, followed only by a post factum substantiation of the mutual conformity thereof (see e.g. MoES, 2011f: 130).

In the end of 2009, the national research and innovation policy of Latvia was **evaluated** by the CREST Policy Mix Peer Review (CREST, 2010). It was reported that Latvia needs significant reforms in order to promote the recovery and development of the innovation system. The recommendations of the Review included the following: (1) to establish the importance of innovation (broadly defined) as an issue through debate at both political and public levels; (2) to establish a Strategic Innovation Policy and governance system, and a national arena, involving key ministers and stakeholders, in which to discuss and agree the elements of such a policy; (3) to move endogenous company innovation to the centre of research and innovation policy; (4) to set thematic priorities based on the actual and potential strength of the economy and align research and innovation policy with these priorities; (5) to reform PhD education system through internationalisation of Latvian research; (6) to alter science-funding rules and give priority to research relating to the thematic priorities; (7) to establish programmes that develop contacts and networking with the Latvian industrial and research diaspora, and (8) link to instruments providing incentives for successful entrepreneurs and researchers to move home.

In many cases the needed changes focus on governance or interventions that are not very expensive but that support the development of capacities and institutions needed for the future (see also Kristapsons, Adamsone-Fiskovica & Draveniece, 2011). It has been argued that larger investments can initially be financed from EU SFs and then gradually transferred to the state budget. Yet, this approach might be difficult to enforce in the foreseeable future given the need to use the state budget to pay back the international loan granted for the purpose of overcoming the crisis.

While this review was well accepted by research community and the provided recommendations have been considered by policy-makers, there was no official government's response to these recommendations. Soon after the expert group produced the Policy Mix Peer Review, CREST was reorganised, renamed to ERAC and given a revised mission. Thereby the review was not formally approved by the CREST committee and was not officially submitted to the Cabinet of Ministers of Latvia. Reference to this evaluation, however, was provided in the informative report prepared by the Ministry of Education and Science (MoES, 2011d) and submitted to the Government. Accordingly, in April 2011 the Cabinet of Ministers made a decision about carrying out, in 2012, an additional external **evaluation of research policy and PROs in Latvia**. Whereas CREST evaluation primarily focused on evaluation of innovation and R&D policy and synergies between the two domains, the upcoming evaluation shall deal more specifically with the assessment of the operation and scientific output of individual research institutes, as stipulated by the Law on Research Activity (see also section 3.3).

Formerly, ERAWATCH Country report 2009 (Adamsone-Fiskovica et al., 2009) attached the highest importance to the policy mix route "Increasing R&D in the public sector", seeing the public sector development as a stimulus for developing R&D also in the private sector. The years 2010-2011 have seen the **policy change to foster**

private R&D investment and the authors of the current report now see the policy mix route "Stimulating greater R&D investment in R&D performing firms" to become of greater importance. This policy change does not imply that PROs are no longer seen as the main beneficiaries of national R&D funding. Rather these have now been positioned along with commercial companies that are becoming more strongly defined as potential recipients and target group of several fiscal R&D and, more notably, innovation support measures.

It can be noted that due to the economic downturn, in the end of 2008 the set of research and innovation policy support measures was re-considered and several EU SF co-funded programmes were either temporarily suspended or experienced their budget cuts. This was the case with the activities aimed at the attraction of highly skilled labour force in companies, establishment of technology transfer centres, development of Riga S&T park, implementation of the cluster programme, upgrading of IT infrastructure for research activities as well as strengthening the development and administrative capacity of research and innovation policy. At the same time among the then prioritised activities one should mention programmes dealing with Competence centres, Liaison offices for technology transfer, Development of new products and technologies, Business incubators, High value added investments, Attraction of human resources to science, Support to doctoral studies, Support for science and research, Development of research infrastructure, etc. Some of the latter, however, have experienced a rather late launch thus also breaking down the logic of their succession and undermining efficient implementation thereof.

On the whole, it can be argued that over the last five years, under the conditions of economic recession, the identification of challenges and the definition of priorities in the field of RTDI policy has become more concrete and more aligned with the economic set-up of the country. At the same time, in terms of concrete policy measures the crisis has exerted a negative impact given the suspension of several important R&D and innovation support programmes, not least due to the lack of resources for ensuring the necessary co-funding from the state budget. Some of the deficiencies have been attempted to be mitigated by the current NRP, yet this has been accomplished only to a limited extent since this programme was elaborated still under the conditions of the economic crisis, when there were only vague ideas of the future development prospects. These, however, can be expected to obtain a more strategic outlook with the upcoming elaboration of the National Development Plan of Latvia for 2014-2020.

3.2 Trends in R&D funding

Despite the earlier forecasts of further reduction of **GERD** as a % of GDP in Latvia in 2010 (2008 - 0.61%; 2009 - 0.46%), it managed to climb back to 0.60% (see Table 1) even under conditions of additional cuts in R&D funding from the state budget – mainly due to the inflow of EU SFs (see also section 1). In absolute figures the total government budget appropriations or outlays on R&D (GBAORD) have decreased from €53m (2008) to €23.5m (2010) with a respective decline also as a % of GDP: 0.29 (2008), 0.20 (2009), 0.16 (2010). This reduction (in 2009 reaching only 28% of the EU-27 average (0.71)) largely features the result of the major impact of the economic crisis on R&D funding in Latvia. The overall trends in GERD positions Latvia still way behind the EU-27 average of 2.1% ranking it among the most lagging EU MSs already since early 1990s.

Following the accession to the EU in 2004, a national target of 3% had been set for GERD. Yet, the provision stipulated by the Law on Research Activity (2005) envisaging an annual increase of GBAORD by 0.15% of GDP until it reaches 1% has not been enforced since the upsurge of the economic crisis and this is not expected to change in the coming years. Currently Latvia no longer adheres to the GERD target of 3% of GDP by 2020 – the NRP (2011) has lowered it to mere 1.5%, instead.

Table 1 : Basic indicators for R&D investments in Latvia

	2008	2009	2010	EU average 2010[s]
GDP growth rate	-3.3	-17.7	-0.3	2,0
GERD as % of GDP	0.61	0.46	0.60	2.0
GERD per capita	62.4	37.5	48.3 (54.8*)	490.2
GBAORD (€ million)	67.17	37,997	40.92	92,729.05
GBAORD as % of GDP	0.29	0.20	0.16	0.76
BERD (€ million)	35,435	30,891	40.55	151,125.56
BERD as % of GDP	0.15	0.17	0.22	1.23
GERD financed by abroad as % of total GERD	23.1	15.5	33.3	N/A[4]
R&D performed by HEIs (% of GERD)	47.4	38.9	40.0	24.2
R&D performed by PROs (% of GERD)	27.6	24.8	23.0	13.2
R&D performed by Business Enterprise sector (% of GERD)	25.0	36.5	37.0	61.5

Source: Eurostat.

s - estimate

* Assuming that the actual population of Latvia in 2010 was 2.0 million.

The most recent trends in R&D funding demonstrate that in 2011 the budget funding for R&D in absolute figures remained at about the same level as in 2010 (€28.9m) and this is the case also for the year 2012. In 2010, the state budget funding was split in roughly equal shares between **institutional** (40%) **and competitive (project-based)** (60%) **funding**. Out of the latter, approx. 60% can be categorised as collaborative funding, which is used in this report to denote projects executed jointly by partners representing different institutional affiliations. While there has been a twofold reduction in the overall state budget funding for science in 2009-2010 due to the budget cuts enforced against the backdrop of economic crisis, the overall balance between the above-mentioned funding instruments covered by the state budget has not witnessed a substantial change over the last three years. These proportions change, however, when considering also the contribution coming from foreign sources (abroad, incl. EU SFs, etc.) to this domain.

[4] 8.4 (2009), 9.04 (2005)

As noted before, the recent years have witnessed a considerable growth in the share of EU SFs (ERDF/ESF)[5] in the overall R&D funding in Latvia, int. al. reinforcing the emphasis on collaborative measures. This has become particularly marked since 2010, when the foreign share amounted to 33% of the total R&D funding (EU SFs specifically could account for approx. 25% of the total funding). This can be expected to carry on in the coming years, with a gradually decreasing trend after 2013. Accordingly, given the competitive nature of all EU SF funding, the overall balance between institutional and competitive funding has shifted notably leaving the former at the level of around mere 17% in 2010. Such an imbalance frequently results in an R&D system with an exaggerated competition based on project-based funding at the expense of stability, which is to be represented by the share of institutional funding (Radosevic 2011: 31). Although increasing the share of competitive funding is considered to be conductive to yielding higher returns in terms of knowledge creation and research output and making research organisations more responsive to socio-economic needs (OECD, 2011a), the level of institutional funding that, in turn, should help to ensure stable long-run funding of research and provide PROs with a stable basis for research activities can hardly be considered adequate in the case of Latvia.

As for the contribution made by the business enterprise sector to GERD, so far it has been rather low and has been seen as one of the main critical issues in Latvia. Yet, between 2008 and 2010 it has increased both in absolute figures (roughly from €35m to €40m) and as a percentage of GDP (from 0.15 to 0.22) (see Table 1). An increase can also be observed in the share of R&D performed by the business enterprise sector as a percentage of GERD as well as in the number of researchers employed by private companies. In 2010 **BERD** had increased to 37% of all R&D funding in Latvia (25% in 2008), thus becoming a more considerable source of R&D funding in Latvia despite the harsh economic crisis. Moreover, additional funding from the private sector is expected to be attracted as of 2011 given the launch of several new funding schemes encouraging public-private partnerships (mainly co-funded by EU SFs: e.g., Competence centres, National research centres).

With regard to additional types of R&D funding, **thematic funding** in Latvia is mainly allocated from the budgetary sub-programme that covers funding for five national research programmes. Mention should also be made of **transnational and inter-regional funding** (as part of total R&D funding from abroad) that in 2010 can be estimated to be around 5% of total R&D funding in Latvia. So far there are hardly any tax incentives in place for promoting R&D in Latvia.

3.3 Evolution and analysis of the policy mixes

The evolution of the Latvian R&D and innovation policy mix over the last decade has been profoundly influenced by joining the EU, becoming involved in the EU FPs and gaining access to the EU SFs. These trends altogether largely reveal a drive towards Europeanisation of this policy domain that is characteristic of most CEE countries (Suurna & Kattel, 2010), though with different implications for policy-making practices and the overall policy mix.

The concept of a policy mix is hereby used to denote the combination of policy instruments, which interact to influence the quantity and quality of R&D investments

[5] Since Latvia is categorised as a single region at NUTS I and II levels, funding co-financed by the ERDF/ESF pertains to the country as a whole.

in public and private sectors (Nauwelaers et al., 2009). Namely, these are policy instruments affecting R&D activities in the private and in the public sector, either directly for instruments from the R&D policy domain or indirectly for instruments outside the R&D domain, which are of particular relevance to R&D activities. Based on the established taxonomy (ibid: 7-8), the national policy mix is hereby analysed specifically with regard to the R&D domain.

R&D policies. Research in the public sector in Latvia is funded through two primary mechanisms: institutional funding (block grants) and competitive funding (see section 3.2). It should be noted that no specific target has been set for the advisable proportions of these two modes of funding, thereby their shares and amount is highly dependent on the overall situation of the national economy.

In more concrete terms, *generic competitive funding* from the state budget managed by the Ministry of Education and Science is offered through grants for basic and applied research and joint research projects, as well as market-oriented research projects – funding mechanisms that have been in existence already for quite some time in Latvia. Yet, for instance, the latter scheme which is aimed at encouraging researchers from HEIs, PROs and SMEs to develop jointly new competitive products, facilitate the development of new start-ups and create new jobs, has been altogether poorly funded, and during the years of economic recession (2009-2010) was even suspended with no new calls launched.

More *sector-specific R&D funding* for selected research projects has been provided by the Ministry of Defence as well as the Ministry of Agriculture, the Ministry of Environmental protection and regional development, etc. However, more recently, four-yearly national research programmes have also been added to this spectrum. The year 2010 was the second time when the national research programmes (currently five) were launched as a mode of thematically-oriented R&D policy pursued since 2005 (see section 1). While these programmes are run on a multi-annual basis, a weakness during the first cycle (2005-2009) lied in the fact that the available funding for each year usually deviated from the initially planned amounts, thus inhibiting strategic planning and implementation thereof. This inconsistency, however, has at least so far been avoided in the current cycle (2010-2013) since a constant annual amount is being allocated for each programme.

With regard to *R&D policies aimed at facilitating structural reform of PRO sector*, the emphasis is to be placed on a number of efforts that have been initiated over recent years in order to evaluate and improve the efficiency of the public research system by altering the organisation of research institutes and research activities, as well as that of higher education. In parallel to completing a two-year Action plan (2010-2011) for implementation of the Guidelines for S&T Development for 2009-2013, the Action Plan for reforming higher education and science (2010-2012) was launched in November 2010. The latter sets out a list of specific actions for (1) enhancing the quality of HE and research activity, (2) modernising the resource base of HE and research institutions and improving resource-use efficiency, (3) internationalisation of HE and boosting competitiveness of R&D, and (4) integration of the HE and science sector with national economy and social development (MoES, 2010a). The Action Plan also envisages an external (international) evaluation of research institutes that stems from the provision in the national law stipulating that research institutes receiving institutional funding have to be internationally evaluated once every six years. Since the year 2011 was the sixth consecutive year after the inception of

institutional funding in Latvia, in April 2011, the Cabinet of Ministers made a decision "On external evaluation of the implementation of science and innovation policy" (see MoES, 2011d) (see section 3.1). The Ministry of Education and Science has been assigned with the responsibility to manage the said evaluation to be carried out in 2012. This evaluation is expected to provide operational expert recommendations for pursuing the envisaged structural reforms in science.

Besides, the preparatory phase for the programme Development of Research Infrastructure (i.e. National research centres) is under way. The general objective of the programme is to increase the capability of R&D activities by developing an internationally competitive R&D system, and specifically to avoid duplication of effort and resources in the purchase of scientific equipment. In total 30 research institutes, selected on the basis of their research output, have started to build partnerships through nine virtual National research centres. The partnering institutes will keep their legal status while benefiting from collectively using the research facilities. The preparatory process of establishing these centres shall be completed in 2012.

As for R&D policies targeting private sector, historically, the Latvian government has provided little direct funding for business-performed R&D. Yet, certain developments in the direction of providing *competitive R&D-related project grants* to commercial companies can be observed with the inflow of EU SFs. Some of the main programmes designed by the Ministry of Economics and currently managed by the Latvian Investment and Development Agency include the following ones: Support for development of new products and technologies (2008-2013); Support for introduction of new products and technologies into production (2008-2013); Investments in development of micro, small and medium-sized companies in specially supported territories (2009-2013); and High value added investments (2009-2013) for development of large scale production plants. Within these programmes, in 2010-2011 new calls were launched for the introduction of new products and technologies into production as well as for high value added investments. In 2012, a new programme for the development of new products and technologies by micro, small and medium-sized enterprises is planned to be launched.

R&D/Innovation policies. The inflow of the EU SFs has also stimulated the development of linkage policies in the domain of R&D and innovation, especially those targeted at *university-industry linkage mechanisms*. Several programmes are aimed at strengthening linkages between the public research base and business, i. e. to facilitate cross-sectoral R&D collaboration. One of the earliest of the currently operational ones is represented by Support for liaison offices for technology transfer (2008-2013) that have been established at 8 HEIs with an aim to increase commercially oriented activities. The Support for Science and research programme (2009-2013), in turn, aims to provide grants for applied research projects that facilitate the integration of science and industry and industrial application of research results, in line with the national thematic research priorities. Eligible entities include PROs or HEIs, and projects can be carried out either individually or in cooperation with business companies or other research institutes. Altogether 122 projects have been approved under this scheme with the total EU SF funding amounting to €47.8m (MoE 2011c: 114). The year 2011 has been marked by the activation of the long-debated Competence centre programme (€84.5m) launched in 2010, which aims at increasing the competitiveness of companies through strategic cooperation with the research sector. Six centres with a strong focus on applied research have been established, involving 72 companies and 11 research institutions in Latvia (MoE,

2011c: 115). It should be noted, though, that the implementation process of the programme so far has been rather cumbersome and further amendments to the regulations are envisaged to be adopted in 2012 in order to strengthen its efficiency.

Aside from the above-mentioned note should also be made of such collaborative R&D programmes as Support to international R&D collaboration (EUREKA) and, more recently, EUROSTARS. With regard to SFs, funding for the Cluster programme is also envisaged to be allocated on a competitive basis as of 2012. Business cooperation (int. al. covering innovation and technology transfer) is promoted by the Enterprise Europe Network in Latvia, managed by the Latvian Investment and Development Agency and the Latvian Technological Centre.

As regards *IPR policies,* some provisions in the Law on Research Activity have been identified as a significant impediment to the legal protection of intellectual property created under state-funded research. According to this Law, the property rights that were created as a result of scientific activity financed from the State budget shall be the property of the state (and not the involved PROs). No national authority, however, holds any responsibility for managing this property. The draft amendments to the Law on Research Activity, elaborated in 2010 with an aim of eliminating this obstructive provision, have been stuck in the national legislative system (see Annex, section 5).

R&D specific finance policies. Latvia does not have any notable tax measures for R&D, with the main emphasis so far placed on direct financial support given the financial limitations of private sector in general and for R&D, in particular.

R&D specific human capital policies. Certain developments can be identified in Latvia both with regard to *R&D specific education and employment policies.* The former has been addressed by the EU SF co-funded programme Support for implementation of doctoral study programmes (2009-2015). It aims to substantially increase the number of PhD students and researchers with a PhD degree, especially in natural sciences and engineering, in order to retain the critical mass of human resources available for ensuring continuous R&D activities and adequate levels thereof (see also Annex, section 2). In its turn, the programme Attraction of human resources to science (2009-2013) aims to promote the attraction of additional human resources to science. It envisages support for forming new research groups and developing cooperation with HEIs, PROs and business companies, facilitating re-emigration of expatriate Latvian researchers as well as attraction of foreign researchers and encouraging involvement of young scientists in research projects.

Non-R&D specific policies. While most of the above-mentioned schemes can be classified as R&D-specific ones, there are also several incentives that can be attributed to non-R&D specific policies that potentially contribute also to the development of this domain. Here, for instance, mention should be made of the EU SF co-funded programme Enhancing motivation for innovation and business start-up that is more generally aimed at promoting public understanding of innovation and facilitating entrepreneurship incentives among the population (int. al. by means of competitions, seminars and training courses). A certain role in this respect is also played by the annual Export and innovation award that is presented to merchants for achievements in exports and development of knowledge-based products (goods or services). Likewise, with regard to financial aid to business companies, in October 2011 regulations governing an EU SF co-funded activity on the Holding fund for the investment in guarantees, high-risk loans, venture capital funds and other financial instruments were adopted by the Cabinet of Ministers. This activity can be seen as a

follow-up of the former programme of venture capital managed by the Latvian Guarantee Agency. Two venture capital funds for SMEs - Imprimatur Capital and BaltCap Latvia – currently act as seed and venture capital investors in Latvia under the JEREMIE (Joint European Resources for Micro to Medium Enterprises) initiative.

3.4 Assessment of the policy mix

The Latvian R&D system and innovation system have not been truly integrated. Since R&D system is public research-centred, the majority of R&D is performed by public universities and state-owned research institutes. The design and implementation of research and innovation policies is shared between the Ministry of Education and Science and the Ministry of Economics, and not steered at the highest political level. A certain indication towards a more coordinated approach is demonstrated by the declaration of the new government in office as of 1 November 2011 envisaging the transfer of the rights to develop innovation policy from the Ministry of Economics to the Ministry of Science and Education (CoM, 2011a). However, it is still unclear when and how this could be put into effect given the fate of other initiatives/reforms that have been envisaged in different policy documents but have remained either unfulfilled or have been substantially delayed. It is also too early to assess to what extent is the newly established high-level Cross-sectoral Coordination centre going to contribute to a better national governance of R&D.

So far the promotion of research and innovation has not been identified as a key contributing factor to enhance competitiveness, job creation and improve the quality of life in Latvia. The role that R&D and innovation could play in the acceleration of economic development and in the recovery from the economic recession has not yet been duly considered by the authorities. At the same time the current set of research and innovation funding mechanisms is, perhaps, insufficiently effective, consisting of too great diversity. The lack of notable progress with regard to boosting research and innovation in Latvia has also been attributed to non-strategic planning of the EU SFs and the low quality of the evaluation studies on the absorption of these funds. These features are crucial especially given the heavy reliance of Latvia on the SFs in the domain of R&D and innovation. The same applies to the scarce budgetary resources. With regard to the latter it can be mentioned that while the report on the Development of S&T in Latvia produced by the Ministry of Education and Science (MoES, 2011d) claims to provide an assessment of the national research programmes (2005/2006-2009), the given analysis stays at a rather formal level without any critical reflection on the implementation, outcomes and broader impacts of these programmes.

Table 2 : Assessment of the policy mix

Challenges	Policy measures/actions	Assessment in terms of appropriateness, efficiency and effectiveness

Challenges	Policy measures/actions	Assessment in terms of appropriateness, efficiency and effectiveness
Unstable R&D funding and governance system	• Provision of the Law on Research Activity (2005) stipulating that state funding shall increase annually by 0.15% of GDP until it reaches 1%. • Establishment of the Prime Minister's Cross-sectoral Coordination centre (Dec. 2011). • Reforms of higher education and science (2010-2012). • International evaluation of research institutions receiving institutional funding (2012). • Assessment of national research and innovation policy (2012).	• Over the last several years the legal norm has not been met thereby providing no contribution to stabilising national R&D funding. • Given the very recent establishment of the new high-level body, it is too early to assess its impact on the R&D domain. • It is envisaged to introduce tougher eligibility standards for registering a new research institute and to revise the research-related criteria for allocating institutional funding to PROs and public HEIs.
Limited innovative capacity of the enterprise sector	• Programme "High value added investments" (2009-2013). • Programmes "Support for development of new products and technologies", "Support for introduction of new products and technologies into production" (2008-2013). • Programme "Support for developing SME's in specially supported territories" (2009-2013). • Programme "Enhancing motivation for innovation and business start-up" (2009-2013). • Export and innovation award (2005-).	• The current programmes represent a mix of measures aimed at providing support to boosting the entrepreneurial activity in general that could, in turn, serve as a basis for facilitating the development and growth of innovative companies.
Insufficient supply and sustainability of skilled labour force	• Programme "Attraction of human resources to science" (2009-2013). • Programme "Support for implementation of doctoral study programmes" (2009-2015). • Reforms of national HE and research (2010-2012).	• Reasonable measures showing first positive results. E.g. more than 200 candidates defended their doctoral thesis in 2010 (an increase of 25% compared to 2009). Nevertheless, the sustainability of fixed-term financial aid can be questioned due to the lack of post-doctoral grants, sufficient and secured institutional funding, etc.

Challenges	Policy measures/actions	Assessment in terms of appropriateness, efficiency and effectiveness
Underdeveloped and weakly motivated intra- and intersectoral collaborative practices	• Competitive grants for joint research projects (domestic) (1994-). • Support for market-oriented research projects (1993-). • Establishment of nine National research centres (virtual research facilities) (2011-) • Programme "Competence centres" (2010-2015).	• The established (state-budget funded) funding schemes have so far made up only a small fraction in the total R&D funding, while the newly launched EU SF co-funded programmes have the potential of providing a more considerable leverage effect.

In regard to support measures for R&D and innovation, there can hardly be made a distinction between those directly fostering innovative performance and the ones shaping and affecting the broader economic framework conditions that are relevant for innovative performance as part of the overall R&D and innovation policy mix (OECD, 2011b). The existing policy mix is partially suited to tackle the identified structural challenges facing the innovation system. As regards the limited innovative capacity of the business enterprise sector, several policy measures/actions can be identified that have been launched with an aim of facilitating the start-up and growth of innovative companies (see Table 2). The current government, in power as of 25 October 2011, and the new Minister of economics have also made initial attempts to address the re-orientation of the national economy towards industrial development and strengthening the linkage with higher education and applied science.

The Competence centre programme may be seen as a mitigating factor in tackling at least two of the identified structural challenges regarding the innovative capacity of the enterprise sector and the development of collaborative practices. Yet, this programme has faced many bureaucratic obstacles and unresolved legal matters, and thereby it well illustrates the overall situation that an efficient implementation of support measures is largely hindered by the limited experience in designing and managing such large-scale programmes. Also, the policy measures to attract additional human resources to science against the background of major outward migration of the Latvian population cannot be expected to give straightaway and guaranteed results. Many scientists that had a successful start of their career in Latvia now work abroad and though certain attempts are made to attract them back, so far these have been limited in their capacity to achieve notable numbers of re-emigrant researchers. While the Support for implementation of doctoral study programmes is seen to be a rather successful policy measure as the number of individuals having received doctoral degrees has been growing, these programmes are not specifically aligned with the priorities set in the domain of research and national economy. Likewise, these are not followed up by post-doctoral grants allowing these individuals to stay within the research domain.

Aside from the quantitative aspects of human resources, the quality of the HE and research activities are also high on the agenda. Certain positive developments can recently be traced in addressing the relative international seclusion and underperformance of national HE and research sectors (see Annex, section 4). The launch of the action plan for reforming national HE and research (2010-2012) can be expected to serve as an impetus for advancing some long needed changes, yet the

factor of potential resistance of the established structures cannot be ignored. For instance, it took quite some effort to pass amendments to the Law on HEIs in 2011 that stipulate new provisions facilitating the attraction of foreign guest lecturers (at least 5% of all academic staff) and a mandate granted to public HEIs to carry out study programmes not only in Latvian but also in the official languages of the EU (up to 10% in each programme). At the same time the proposal to admit also Russian as the language of instruction at public HEIs was rejected thus leaving the latter in an unfavourable position in the competition for foreign students from the neighbouring Russian-speaking countries vis-a-vis private HEIs that are not legally bound by such a restriction. Along with these provisions also stricter criteria to researchers and PROs have been set with an aim to enhance internationalisation, openness of research organisations and improve their competitiveness.

The existing evaluations and analysis of the current policy mix aimed at fostering RTDI in public and private sectors in Latvia and the effectiveness of support measures identify a range of bottlenecks. The report of the high-level task force on the necessary support for the development of new exportable products in cooperation with Latvian scientists points to their unpredictability in terms of timing (especially crucial for innovative business companies) as well as the limited amount of the available funding and the rigid system of project evaluation under the currently operational programmes (Kalviņš et al., 2010). Likewise, experts point to the essential lack of measures regarding IPR protection in the public sector inhibiting its commercialisation, the limited incentives of the tax system for increasing private sector investments in R&D, as well as the lack of technology incubators for high-growth companies and seed funding for high-risk companies. It should be noted that a comprehensive analysis of the whole spectrum of measures undertaken by the Ministry of Education and Science in developing and implementing national research policy in 2007-2011 is expected to be accomplished by the State Audit Office of Latvia in early 2012.

The **existing policy mix** in Latvia is targeted toward improving the integration of the innovation and R&D system and horizontal coordination within it. The EU SFs are used to strengthen the innovation support system and there is increased funding for R&D, also in the business sector. Much closer cooperation between public research sector and business sector is being encouraged, but much more has to be done to increase the impact of the input made by the R&D sector on the innovation process. To this end, it is also very important that the current government pledges to develop industrial sector and strengthen the linkage with higher education and applied science. As regards R&D specific and innovation financing policies, the annual volumes of many support measures remain rather insignificant that so far have not been very conductive for efficiently addressing the major structural challenges. Yet certain policy trends featuring positive developments over the review period can be identified with regard to selected newly launched support measures. Besides, in April 2011, the Government made a decision about carrying out an additional in-depth evaluation of the implementation of research and innovation policy in 2012 that could contribute to more strategic and evidence-based approach to policy making.

Considering the **possible directions for the evolution of the current policy mix**, the bulk of the national RDI policy measures in Latvia by 2020 is likely to remain focused on R&D specific financial policy, based on EU SFs in particular. These funds should be mainly channelled for providing support to development of innovative enterprises by means of placing company innovation to the centre of research and

innovation policy and facilitating long-term cooperation between enterprises and scientists. It is crucial to alter the principles for the allocation of state science budget by giving priority to research relating to the thematic priorities in a systematic way. In addition, concrete efforts are to be made for ensuring further rejuvenation and expansion of the research and academic staff as well as enhanced contacts and networking with the Latvian industrial and research diaspora, int. al. to facilitate partial return of expatriates. This could be notably encouraged if 3-4 national research centres would be advanced towards becoming world class centres of excellence in terms of research infrastructure, staff competencies and remuneration.

At the same time, as argued by innovation policy analysts, innovation- and knowledge-based growth requires complementary policies, which go beyond the scope of an explicit innovation policy to cover the wider domains of competition, higher education, labour market and financial market (Radosevic, 2011). It is also noted that there is a lack of incentives for non-R&D innovators in the economies of CEE countries, which are generally behind the technology frontier and thus should see technology transfer (rather than technology creation) and non-R&D-based innovation activities as the main, though not the sole, drivers of innovation at this stage of catching up (ibid.). Besides, in view of differences in innovation capacities among the EU-27, analysts deem unrealistic to expect that similar policies and indicators can be used to gauge and benchmark the innovation performance of such diverse membership (Aghion et al., 2011). Given the low performance of Latvia and the country-specific structural challenges, there is a need for a specifically fitted policy approach in the development and implementation of new R&D and innovation support measures.

4 National policy and the European perspective

The national policy in the domain of research and innovation can also be characterised with reference to the objectives set forth for the development of the European Research Area (ERA). The Table below identifies the main short and medium-term challenges at national level and recent policy changes in Latvia along the lines of the seven ERA dimensions that can be derived from the analysis provided both in the preceding sections as well as in the Annex on the alignment of national policies with ERA pillars.

Table 3: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

	ERA dimension	Main challenges at national level	Recent policy changes
1	**Labour Market for Researchers**	• Ensuring stability and international competitiveness of researchers' remuneration • Facilitating a much more balanced inward and outward flow of researchers	• Implementation of the EU SF co-funded programme "Attraction of human resources to science" • Amendments to the Law on HEIs providing for increased attraction of foreign guest lecturers

	ERA dimension	Main challenges at national level	Recent policy changes
2	**Cross-border cooperation**	• Developing a more strategic approach to joint programming and jointly funded research activities with partner countries • Strengthening national research programmes to enable selective openness to foreign legal entities	• Implementation of the established (mainly externally funded) programmes for cross-border cooperation
3	**World class research infrastructures**	• Providing efficient means for making full use of the nationally available RIs by all stakeholders • Ensuring the political framework and systematic support for national participation in relevant ESFRI projects • Fostering adequate training and supply of researchers capable of handling advanced research technologies	• Launch of the EU SF co-funded programme "Development of research infrastructure" (National research centres) • Drafting of the National ESFRI roadmap (underway) • Gradual involvement of Latvian partners in several ESFRI roadmap projects
4	**Research institutions**	• Undertaking targeted and timely actions for implementation of the planned reforms of national HE and research (incl. the new model of HEI funding) • Facilitating mobilisation of research competencies and resources conductive to the development of large-scale projects • Providing more reliable long-term funding of research institutions on a national level	• Launch of an international evaluation of the HE study programmes • Adoption of amendments to the Law on HEIs setting stricter criteria for the operation of HEIs • Incentives for introducing performance-based funding model of HEIs • Development of National research centres (EU SF co-funded programme "Development of research infrastructure")

	ERA dimension	Main challenges at national level	Recent policy changes
5	**Public-private partnerships**	• Ensuring full delegation of rights over IP created as a result of state-funded research to the involved PROs • Securing preferential legal framework conductive to the development of public-private R&D partnerships • Promoting more substantial representation of researchers in the business sector	• Draft amendments to the Law on Research Activity • Continued support to 8 liaison offices for technology transfer at HEIs • Resumption of new calls under the national funding scheme for market-oriented research projects • Implementation of the EU SF co-funded programmes "Support for science and research" and "Competence centres" • Draft proposal of the programme "Innovation in 'green' manufacturing" • Planned launch of the Cluster programme
6	**Knowledge circulation across Europe**	• Expanding the scope and intensity of reciprocal international exchange of HE students and academic staff • Ensuring efficient means for facilitating beneficial return of outbound human resources • Speeding up the development of institutional repositories providing open access to scientific information • Motivating researchers towards more intensive publication of scientific papers in international journals	• Amendments to the Law on HEIs allowing for study programmes in the official languages of the EU • Draft regulations on granting scholarships to foreign students for pursuing studies at Latvian HEIs • Enhanced coordination of scholarships for outbound students and research staff • Withdrawal of former funds for individual scientists earmarked for covering costs associated with participation in international conferences and organisations
7	**International Cooperation**	• Broadening the thematic scope and intensifying research cooperation with third countries • Encouraging elaboration of proactive collaborative research projects lead by Latvian peers	• Implementation of the EU SF co-funded programme "Support for international collaborative projects in S&T"

Annex: Alignment of national policies with ERA pillars / objectives

1. *Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers*

1.1 Supply of human resources for research

Since 1998 the **number of researchers** (FTE) had gradually increased from 2,557 to 4,370 by 2008 (CSB, 2011). However, in 2009-2010 a reduction could be witnessed again featuring a drop to 3,807 researchers (FTE) (ibid.). The percentage of human resources in S&T as a share of labour force in Latvia has decreased from 39.9% in 2008 to 37.8% in 2010, while the EU average figures demonstrate a slight increase from 39.6% to 40.5%, respectively (Eurostat, 2011). A more sharp difference, however, can be observed with regard to the percentage of R&D personnel (FTE) in active population where Latvia has witnessed a drop from 0.54% in 2008 to 0.46% in 2009, which makes up only 43% of the EU-27 average (1.07% in 2009) (ibid.). The recent downward trend can be related to major emigration of Latvian population (incl. skilled labour force) following the economic crisis since 2008 (see Hazans, 2011).

Several **policy measures** have been launched to increase the number of researchers in Latvia. The EU SF co-funded programme "Attraction of human resources to science" launched in 2009 has attracted an additional R&D staff of 623 persons (FTE) that make up almost 10% of all R&D staff (MoES, 2011a: 4). Likewise, largely due to the notable scholarships for PhD students and candidates (ca. €1,000 per month) funded from EU SFs since 2009 (Support to the implementation of doctoral programmes), the number of newly awarded PhDs has been increasing quite substantially – while during 2000-2004 the annual number was below 100, it is envisaged to go beyond 200 in 2011. However, it is still way below the annual target of 425 new PhDs (MoES, 2009: 23). By June 2011 these scholarships have been granted to 1,346 individuals. In 2011, several amendments to the regulations governing the allocation of these scholarships were adopted with an aim to increase the return from these investments. Similar scholarships (ca. €500 per month) are also being granted to master students in the fields prioritised by the state. A somewhat positive trend is demonstrated by the age distribution of doctorate holders – while their overall number had decreased between 2006 (3,603) and 2009 (3,462), there has been a relative increase in the younger age groups (CSB, 2011). Given the above-mentioned policy measures, the age structure of doctorate holders can be expected to change even further towards its rejuvenation in the coming years.

There are no recent comprehensive studies available on the **inward/outward flow of researchers**. Yet, data on the changes in the number of international agreements and exchange of academic staff at Latvia HEIs demonstrate that the number of agreements has increased from 578 in 2004 to 1,288 in 2009 and the number of visits from 456 to 682, respectively. In 2010, the number of short-term visits of individual scientists arranged on the basis of agreements between the Latvian Academy of Sciences (LAS) and its foreign counterparts made up 43 outgoing and 52 incoming visits (LAS, 2011). Though the intensity has been fluctuating, on the whole there has been a notable increase from the initial levels of 29 and 19 visits

respectively in 1995. An indication of mobility flows of researchers-to-be is provided also by the share of foreign exchange students at Latvian HEIs, which has increased by 53% in 2003-2011 (from 1,269 to 2,717 students), now making up 3% of all students (MoES, 2011c). In its turn, the number of students from Latvian HEIs undertaking studies abroad in the respective period has grown by 60% (from 673 to 1,684). However, on the EU level these mobility levels are still very low. As noted by the Innovation Union Competitiveness report, in 2007 Latvia was among the EU countries with the lowest percentage of doctoral candidates from other EU MSs (1% in comparison to the EU average of 7%) (EC, 2011a: 275). Yet, these flows can be expected to increase given the strong policy drive towards increased internationalisation of national HE and research system (see Annex, section 4).

1.2 Ensure that researchers across the EU benefit from open recruitment, adequate training, attractive career prospects and working conditions and barriers to cross-border mobility are removed

While the gross **average monthly salary** by individuals falling under the category of "Scientific research and development" (NACE 72) witnessed a notable increase by 66% between 2005 (EUR 407) and 2008, it dropped by 16% in 2009 and climbed back only by 11% in 2010 (EUR 871) (CSB, 2011). Yet, according to the data on the first three quarters of the year 2011 provided by the State Revenue Service, it has decreased again by 12% to EUR 768. In comparison to the overall average salary in the country, this area of activity in 2010 was by 17% more profitable. Nevertheless, it is far from competitive on a European scale since, according to Eurostat, in 2010 the average annual gross earnings by economic activity "Professional, scientific and technical activities" (NACE 74) in Latvia (EUR 9,846) made up only 14% of the same earnings in Norway, 30% of those in Cyprus and 67% - in the Czech Republic.

Universities and PROs have a rather high degree of flexibility in **setting the level of salaries** for their academic staff. Individual income can vary significantly depending on the number and scope of research projects, both national and international, in which researchers are involved. Yet, the comparatively limited and annually fluctuating amount of fixed monthly salaries as part of institutional funding and the resulting strong dependence of researchers' remuneration on project-based funding is not very conductive to the career and income stability in this domain. Besides, the current regulations governing public procurement limit the scope of potential participants in tenders only to those, which demonstrate income above 70% of the average monthly income in the respective branch in the country. Given the differentiated salary levels in different areas of research, this provision limits the possibilities of underfinanced PROs.

Latvia has clearly recognised the need to put efforts in major academic staff and researcher renewal and development. The primary effort to correct the existing deficiencies is focused on **internal human resources** - providing doctoral training to considerably bigger number of students and to retrieve those working abroad (see Annex, section 1.1.). However, given the fact that these incentives (Support to the implementation of doctoral programmes, Attraction of human resources to science) are currently mainly based on short-term endowments provided from the EU SF co-funded programmes, the sustainability of these efforts in providing and maintaining the necessary human resources can be questioned. At the same time, following an extensive public debate on the facilitation of necessary changes to allow universities to become more open for international students and study programmes, the

amendments of July 2011 to the Law on HEIs (1995) now stipulate that as of 2014 at least 5% (3% as of 2013) of teaching staff shall be attracted from abroad.

The employment of **foreign researchers** in Latvia is governed by the mandatory legislation on immigration and research activity. The Law on Research Activity, last amended in 2010, and the Cabinet Regulations (CoM, 2008) incorporate legal norms arising from Council Directive 2005/71/EC of 12 October 2005 on a specific procedure for admitting third-country nationals for the purposes of scientific research. It means that accredited scientific institutions are entitled to recruit third-country nationals to participate in scientific research projects. A foreign national visiting Latvia for employment, irrespective of the duration of the stay in Latvia, is required to have a temporary residence permit. An EU researcher and a third country national, having a permanent residence permit and/or the status of a long term EU resident, may apply for any research position in Latvia. In case an academic or professional qualification is obtained in a country other than Latvia, its official recognition is a prerequisite for both Latvian and foreign researchers to be able to apply for academic positions in Latvia. Latvia participates in the European diploma recognition networks ENIC/NARIC and in the international cooperation of the Europass framework.

Academic position vacancies in scientific institutions are announced in the official newspaper *Latvijas Vēstnesis,* which is available only in Latvian, and, in individual cases also in English on the websites of the respective HEI/PRO; the use made of announcements placed in the EU-wide database of the EURAXESS portal in Latvia so far has been very limited. While research grants awarded in Latvia are portable to another national research institution, the current law doesn't regulate their portability to another country. So far only one Latvian HEI – the Riga Technical University[6] – has been enlisted among the institutions having signed the declaration of endorsement of the 'Charter for Researchers' (EC, 2008), which provides recommendations to the EU MSs on the career management of researchers. There is, however, no representative statistical information available on the frequency of foreign researchers' joining Latvian HEIs and/or PROs (see also Annex, section 1.1). The main barriers seen as hindering a substantial inflow of scientists from other countries mainly include uncompetitive salaries and underdeveloped research infrastructure.

1.3 Improve young people's scientific education and increase interest in research careers

Young people are defined as one of the main target audiences of public communication of science in Latvia with an aim of increasing their interest in science in general as well as in pursuing a research career (MoES, 2009: 20-21). So far the general students' scientific interest and achievements in Latvia have been assessed as comparatively low (Gedrovics, Mozeika & Cedere, 2010). According to the data of the "Programme for International Student Assessment" (PISA), in 2009 Latvia was among the countries where the average **performance** of 15-year-olds in terms of scientific literacy was lower than the EU average (Eurydice, 2011: 16-18). On the positive side, however, it can be noted that this performance has slightly increased since 2006, besides the proportion of students lacking basic skills in science (low achievers) in Latvia was only 14.7% against the EU average of 17.7% (ibid.).

[6] http://ec.europa.eu/euraxess/index.cfm/rights/charterAndCode#L (accessed on 11.12.2011)

A range of measures aimed at carrying out **systemic reforms in science and mathematics education** has been undertaken in Latvia already since 2005 with financial support from the EU SFs. The reforms in basic and secondary education have been implemented with an aim to enhance the quality of the teaching and learning of math, science & technology in general and the interest in and the motivation for physics, chemistry, biology, natural sciences and mathematics of students in particular (EC, 2009: 6). These reforms, coordinated by the State Education Centre, have been implemented through two major projects co-funded by the European Social Fund (ESF) in 2005-2008 ("Curriculum Development and Teacher In-service Training in Science, Mathematics and Technology"; EUR 13m; grades 10-12) and 2008-2011 ("Science and Mathematics"; EUR 5m; grades 7-9). They have been targeted at facilitating changes in the contents and the process of studies based on inquiry-based learning, acquisition of knowledge with personal and daily relevance and development of research skills of students. As noted by an international team of experts, the maths and science reform in Latvia carried out in 2005-2011 represents an outstanding example of a thorough in-depth, efficient and comprehensive reform as to science and maths education (ibid.: 7).

Since 2008, a range of EU SF co-funded activities have also been launched by the State Education Development Agency – e.g. "Support to ensure sufficiency of general education educators in priority subjects" (ESF; EUR 16m), "Provision of appropriate material supplies required for the implementation of high quality natural science programmes" (ERDF; EUR 31m). For instance, as a result of the latter activity 225 secondary schools have been supplied with new, modern study materials for chemistry, biology, physics and mathematics (MoES, 2011c). Rather notable reforms are also carried out with regard to the vocational education aimed at improving the study infrastructure and acquired competencies of students.

A range of efforts are also being made to facilitate an increased involvement of secondary school leavers in the HEI study programmes in natural and exact sciences that so far have attracted far less students than do the social sciences. In 2009/2010, only 13.4% and 6.4% of all students pursued studies in the thematic fields of 'engineering, manufacturing and construction' and 'natural sciences, mathematics and IT', respectively (MoES, 2011c). Prioritisation of the underrepresented fields (natural sciences, engineering, environmental science, health care) is promoted by a differentiated distribution of state-funded study places. As demonstrated by a study on the **satisfaction of engineering students at Latvian HEIs** (RTU, 2011), engineering studies are chosen mainly due to the availability of these state-funded places as well as the prospects of getting a well-paid job. On the whole, students feel satisfied with the study process, and the majority express willingness to pursue their career in the chosen study area. At the same time students make up a disproportionally high share of potential emigrants in Latvia (Hazans, 2011) implying that many of them might not pursue their career in Latvia. The situation might be tensioned also by the notable reduction of the overall number of students in the coming 7-10 years as envisaged by the estimates of demographers.

1.4 Promote equal treatment for women and men in research

Latvia features a rather balanced quantitative representation of women and men in the field of research. In 2009, the share of women researchers (FTE) in Latvia was 50.3% of all researchers, whereby the respective share in the EU on average reached only 30.2% (Eurostat, 2011). At the same time the **percentage of females** in human resources in S&T as a share of labour force of Latvia in 2010 made up

46.4%, while the respective share of males was only 29.1% (ibid.). This correlates with the fact that, for instance, in 2010/11, the percentage of female graduates at Latvian HEIs made up 71% of all graduates (MoES, 2011c). This predominance of women, however, does not translate directly into the patterns of the academic staff – while the share of females in the academic staff (main work) makes up 71.8% at colleges, the respective share at HEIs is only 55.4% (ibid.: 60-61). Furthermore, the share of female full professors at HEIs in 2010/11 reached only 32% (29% in 2007/08), gradually increasing only at lower ranks – 47% among associate professors and 58% among assistant professors (ibid.). The same can be attributed to the representation of women in high-ranked positions in decision-making and representative bodies.

There are also escalating gender disproportions in selected branches of science. In 2010/11, predominance of women among the students of HEIs and colleges could be observed in the **thematic groups** of Education (88%), Health and welfare (85%), Humanities and art (76%) as well as Social sciences, business and law (67%) (CSB, 2011). In their turn, male students strongly dominate the thematic fields of Engineering, manufacturing and construction (79%) and Natural sciences, mathematics and information technologies (69%) (ibid.). Data from the surveys of doctorate holders (2006 and 2009) also reveal that despite the notable trend towards levelling of the **average gross earnings** between men and women, the latter still receive 23% (32% in 2006) less than their male counterparts (ibid.). Interestingly, this difference in 2009 was much more marked among those doctorate holders that are engaged in research (25% less for women) in comparison to only 7% difference among those not engaged in research. Women also make up a larger share in the percentage of job seekers among the economically active population with higher education in 2010 – 22% in comparison to 11% for men (ibid.).

Formally, a researcher career is not gender dependent in Latvia. The Labour law provides equal opportunities for females and males and restrict discrimination against women in employment. The Law stipulates that a woman who makes use of **maternity leave** shall have ensured her previous job or, if not possible, a similar or equivalent position with not less favourable conditions and employment provisions. Every employee has the right to parental leave in connection with the birth or adoption of a child. At the same time the qualitative study on women in sciences and high technology in the Baltic States reveals that despite some recent changes one can still observe a dominant support to traditional gender roles in family in Latvia (BASNET 2007: 103-159). Also preference is given to an early return from a maternity leave in order to retain the former position and status in science (ibid).

Given the comparatively limited articulation of science-related gender issues in the public discourse, so far no specific **policy measures** have been undertaken on a national level to promote the role of women in science. Nevertheless, mention can be made of the annual “For Women in Science” grants, which are being awarded to selected Latvian female scientists since 2005 jointly by the L`OREAL Baltic, the national commission of UNESCO in Latvia and the Latvian Academy of Sciences. In 2008, a foundation “Latvian women in science” was established with an aim of achieving equal and full participation of women in all scientific disciplines and at all levels as well as stimulating research and education in women's studies.

2. Facilitate cross-border cooperation, enhance merit-based competition and increase European coordination and integration of research funding[7]

So far there have been limited targeted mechanisms contributing to the openness of research organisations and national programmes to foreign researchers in Latvia. National programmes are generally designed for local researchers with a common condition for beneficiaries to be registered in the national register of scientific institutions automatically excluding foreign institutional and individual participants not residing and registered in Latvia. The Law on Research Activity also specifies that state budget funding for research activities can be allocated only to those institutions listed in the register. Besides, in most cases the terms of reference are provided only in the national language thereby limiting the possibilities for foreign applicants.

Accordingly, foreign researchers can be involved in the execution of national R&D programmes only if being employed as individual researchers by a local scientific institution. In the latter case no specific provisions placing restrictions on the participation of foreign researchers in national R&D programmes are provided, yet this has more to do with the so far limited number of leading cases rather than an intentional national policy strategy. The only recent exception with regard to the presence of national regulation is the EU SF co-funded programme "Attraction of human resources to science" that inter alia aims to facilitate re-emigration of expatriate Latvian researchers as well as attract foreign researchers. But this also pertains only to researchers intending to move to Latvia. Otherwise, the general rationale of national authorities for limiting access of non-domestic researchers or research teams that might be willing to conduct work in their home countries to funding made available for national R&D programmes is largely based on the scarcity of national R&D budget funding that is already being severely struggled for by nationals. Such a strategy also implies a certain degree of protectionism of national research centres, which do not always meet the international standards that would guarantee their position in an equal competition with foreign peers.

Nevertheless, a range of activities are being undertaken in Latvia for facilitation of cross-border cooperation with regard to coordination of research. As part of the declaration on strategic cooperation between the three largest Baltic universities signed in April 2011, negotiations among the rectors of these universities have taken place on the potential for pursuing cooperation in developing joint projects of strategic relevance to the region in the framework of the next EU planning period. This debate has also covered the possibilities for identifying individual areas of excellence in research not to be duplicated by the neighbouring countries. Likewise, mention can be made of the EU Baltic Sea Region (BSR) Programme 2007-2013, as well as bilateral cross-border cooperation programmes with Lithuania, Estonia, and the Central Baltic Programme facilitating implementation of projects also dealing with research and innovation.

[7] Promote more critical mass and more strategic, focussed, efficient and effective European research via improved cooperation and coordination between public research funding authorities across Europe, including joint programming, jointly funded activities and common foresight.

- Ensure the development of research systems and programmes across the Union in a more simple and coherent manner.
- Promote increased European-wide competition and access of cross-border projects to national projects funding

3. Develop world-class research infrastructures (including e-infrastructures) and ensure access to them

One of the officially approved medium-term tasks of national research policy for 2009-2013 is to foster integration in the ERA, by supporting participation in technological platforms and other international initiatives as well as developing RIs of interest for the European and international research communities (MoES, 2009: 25-26). In 2007-2013, €146m have been earmarked for the **national programme "Development of research infrastructure"** co-funded by ERDF. By the end of November 2011, all 9 applications for the status of National research centres submitted by the eligible research institutes had been approved (see Annex, section 3.3). In response to the second open call on business development projects launched under this programme 29 proposals have been submitted to be evaluated by the end of 2011. Access to the research equipment and facilities funded under this activity shall be provided to other interested parties for the market price of the relevant service.

The ESFRI (European Strategy Forum on Research Infrastructures) annual report of 2009 enlisted Latvia among the five (out of 33) countries not having initiated the process of drafting their **national ESFRI roadmaps** (ESFRI, 2010: 11). The 2010-2011 action plan for the implementation of the Guidelines for Development of S&T for 2009-2013 (MoES, 2010b) stipulates that the national plan of Latvia for the development of research infrastructures (RIs) of European importance should be elaborated by mid-2011 and the ESFRI-class RIs are to be identified by the end of 2011. The above-mentioned action plan also envisages funding to be allocated for the establishment of four to five ESFRI-class infrastructures. The importance of the issues regarding RIs and their strong interlink with the criteria of scientific excellence has been re-emphasized also by the new Minister of Education and Science in the position of Latvia on the elaboration of the new EU FP for Research and Innovation "Horizon 2020" (MoES, 2011e). However, by the end of 2011 no official policy document regarding the national ESFRI roadmap has been published in Latvia.

So far Latvian representatives have been involved in such **ESFRI roadmap projects** as the Common Language Resources and Technology Infrastructure, the European Spallation Source, the European Social Survey and the Integrated Structural Biology Infrastructure for Europe. Certain interest has been demonstrated also with regard to the Council of European Social Science Data Archives, Biobanking and Biomolecular Resources RI, European Life Sciences Infrastructure for Biological Information, Pan-European RI for Nano-Structures and the Partnership for Advanced Computing in Europe. With regard to the national participation in **inter-governmental European RIs**, Latvian researchers have been involved in the European Fusion Development Agreement. As of June 2011, Latvia has been granted observer status at the European Space Agency. While Latvia is not an official member of the European Organisation for Nuclear Research, Latvian researchers have contributed to selected research projects. Negotiations have taken place on the possibilities of joining the European Synchrotron Radiation Facility. A cooperation agreement has been signed with the European Centre for Medium-Range Weather Forecasts.

4. Strengthen research institutions, including notably universities

In 2010/11 there were 56 (34 public and 22 private) higher education institutions (HEIs) in Latvia, out of which six are public universities, 26 specialised HEIs and 24 colleges (MoES, 2010a). All Latvian HEIs pursue their primary **mission** of educating

students, mostly undergraduates, and it overshadows research. Five universities, however, have strongly developed research. Commercialisation of knowledge is being carried out in at least 8 HEIs that have established liaison offices for technology transfer. In terms of broader community engagement (e. g., cooperation with municipalities and NGOs, public communication of science), the designated functions are also gradually becoming more pronounced in the practices of HEIs (Adamsone-Fiskovica & Bundule, 2011; Tisenkopfs, Bela & Kunda, 2011).

The Law on HEIs stipulates that all HEIs in Latvia are autonomous institutions of education and science with the right to **self-governance**. They are free to decide on their overall administrative structures and develop their own academic profiles at the same time all being subject to accreditation procedures. While the design of curricula is generally decided upon by HEIs themselves, the introduction of new programmes requires approval by the Council of Higher Education. HEIs can collect tuition fees from both local and foreign students and they are completely free to set fee levels. Latvia joined the Bologna process in 1999 and both prior and after that has adopted and amended a range of legislative acts governing the HE sector in line with common standards across Europe.

The **amendments to the Law on HEIs** adopted in July 2011 have introduced several provisions that are aimed at boosting the development and international competitiveness of the Latvian HE. Among other things they set stricter criteria for obtaining the status of a university, whereby 65% (previously - 50%) of all academic staff should hold a doctoral degree, while for specialised HEIs the threshold has been raised from 20% to 40%. More demanding criteria have been set for the development and licensing of study programmes and selection of academic staff in general. The amendments also include new provisions regarding joint study programmes, attraction of foreign guest lecturers, as well as a mandate granted to public HEIs to partly carry out study programmes also in the official languages of the EU.

These and other measures have been largely undertaken in the framework of the envisaged **reforms of national HE and research** to be carried out in a three year period 2010-2012 (MoES, 2010a) (see section 3.3). In line with the progress report of the respective action plan (MoES, 2011b), an important development is represented by the launch of an international evaluation of the HE study programmes based on a set of common criteria (quality, mutual overlap, sufficiency of resources, sustainability, international competitiveness) (see CoM, 2010). The whole activity is to be completed in two years with the first preliminary results expected by May 2012. This evaluation is envisaged to result in a reduction of the present number of study programmes and to form the basis for a new accreditation system of HE based on study fields instead of individual programmes.

As of 1 January 2010, new regulations governing the **monitoring of research performance in HEIs and PROs** receiving institutional funding from the state budget are in force (CoM, 2009a). The quality of research is being annually assessed based on such indicators as the profile of executed projects (national, international etc.), scientific publications (number per researcher, citation), cooperation with commercial companies and other clients (contract research, licences, patents), as well as participation in the improvement of higher education and scientific qualification (share of young researchers, newly awarded scientific degrees). The coefficient of development of the scientific institution, which is calculated based on the aforementioned indicators, is then used as a multiplier for the sum of the financial resources allocated for the maintenance of a scientific institution and for the

remuneration of its scientific staff. The above-mentioned progress report also notes the work being carried out by HEIs in defining the study outcomes (knowledge, skills and competencies of graduates) and introducing internal quality assurance systems (MoES, 2011b). In August 2011 a conceptual agreement was reached by the Reform management group headed by the Prime Minister to support the proposal of changing the HE funding model to a performance-based one.

5. Facilitate partnerships and productive interactions between research institutions and the private sector

Facilitation of public-private partnership in the field of R&D and innovation has been set among the four goals of the national S&T development strategy embodied in the Guidelines for Development of S&T for 2009-2013. The action plan of the guidelines for 2010-2011 envisages establishment of research management units at HEIs and PROs along with state aid programmes for technology transfer and innovation/product development as well as measures aimed at efficient protection of intellectual property, etc. (MoES, 2010b).

While the action plan of the Guidelines envisaged the passing of amendments to the Law on Research Activity on the delegation of **rights to use the intellectual property** resulting from state-funded research already in 2010, a delay can be observed in the implementation of the listed measures. While draft amendments elaborated by the Ministry of Education and Science have been reviewed by the Cabinet of Ministers in July 2011, so far (December 2011) the current provision that the property that has been created as a result of scientific activity financed from the State budget shall be the property of the State (and not the involved PRO(s)) is still in force. The new amendments are expected to improve the legal protection, commercialisation and knowledge transfer of such inventions and thus create preconditions for increased private sector investments in research-related activities.

In 2011, the support of 8 **liaison offices for technology transfer** established at Latvian HEIs charged with the task of providing a practical link between research and industry sectors was continued. As a result their activity, in 2010 commercialisation offers of 67 research projects were prepared, 36 patent applications were submitted, and 51 agreements on cooperation of enterprises and researchers were concluded (MoE, 2011b: 116). In addition, several other established schemes have been continued in 2011, incl. the longstanding annual national funding scheme for **market-oriented research projects** aimed at facilitating research-industry collaboration. This is considered to be the most enterprise-friendly measures of such profile. Due to the budget cuts no new calls were launched in 2009-2010 with funding provided only to the projects started in 2006-2008. In 2011, a new call was launched, but the decision of the actual funding to be allocated depends on the approved state budget for 2012.

The EU SF co-funded programme "**Support for science and research**" and **Competence centre programme** launched in 2009-2010 with an aim of facilitating academia-industry integration and collaboration have also been carried on in the review period. In 2010, in the framework of the former programme 114 applied research projects (out of 177 submitted proposals) were approved for funding with the eligible costs amounting to EUR 1m (MoES, 2011a: 26). In its turn, in the beginning of 2011 within the latter programme 6 major contracts (involving 72 enterprises and 17 scientific institutions) have been concluded for the total contractual sum of EUR 53.2m that are expected to attract additional co-funding of

EUR 31m from the private sector by 2015 (MoE, 2011b: 116). Besides, in early 2012, the EU SF co-funded Cluster Programme aimed at facilitating cooperation between mutually unrelated commercial, research, educational and other institutions for boosting the competitiveness or selected branches and business companies, increasing export volumes and development of new innovative products is to be launched.

While it has been expected that a special **Smart Technologies Fund** is to be established in Latvia 2011 (Ziegenbalg & Monteanu, 2010), only on 8 November 2011 the draft proposal of the programme "Innovation in 'green' manufacturing" co-funded by the Norwegian Financial Instrument (2009-2014) (EUR 11.3m) was conceptually supported by the Cabinet of Ministers. Further actions regarding the elaboration of the programme are to be taken by the Ministry of Economics with an actual allocation of funding to start in 2012. The programme is to be aimed at the development of a Technology incubator providing support and grants for companies in technology-intensive branches contributing to the development of "green" manufacturing. It can also be noted that in June 2011 an agreement was signed between the two largest HEIs – the University of Latvia and the Riga Technical University that also envisages establishment of a joint **Science and Technology Park** in Riga.

So far there has been limited **inter-sectoral mobility** of researchers, though the current administrative framework is neither encouraging nor discouraging such mobility. The state aid programme "Attraction of highly qualified workforce" that was launched in 2008 with the specific aim of facilitating such mobility had to be discontinued due to the limited responsiveness of potential beneficiaries. At the same time a strengthening trend can be observed in the involvement of business sector in the governance of universities and PROs in Latvia. As of July 2010, the Latvian Council of Sciences also includes a representative from the Employers' Confederation of Latvia. Continued efforts are made in increasing the role of employers in the development and assessment of vocational study programmes.

6. Enhance knowledge circulation across Europe and beyond

On the whole, the knowledge circulation between Latvia and other European and non-European countries in the field of higher education and research can be seen as steadily increasing over the last decade. The 2010/11 progress report on the action plan for necessary reforms in higher education and science for 2010-2012 notes an increase in the **export volume of Latvian higher education**, which is characterised by the increasing number and share of foreign students (from 1,416 or 1.1% in 2005/2006 to 1,949 or 1.9% in 2010/11) (MoES, 2011b). The report also points to a twofold increase in the number of cooperation agreements signed with foreign HEIs over the last three years as well as continued participation of Latvian students and lecturers in the EU educational exchange programmes. In 2011, an informative internet site on HE in Latvia has been launched for facilitating the attraction of foreign students. In September 2011, draft regulations on granting scholarships to foreign students (based on the existing intergovernmental and interdepartmental agreements) have been elaborated by the Ministry of Education and Science.

There are also several programmes that support cross-border cooperation with regard to RTDI, including, the INTERREG-IV-C programme, the Latvia-Lithuania cross border cooperation programme 2007-2013 as well as the Baltic Sea Region programme 2007-2013. Other examples of intergovernmental initiatives include the

Latvian-Swiss Co-operation Programme (Swiss Scholarship Fund since 2010), the Nordplus Framework Programme 2008-2011 (sub-programme on HE), as well as the European Economic Area (EEA) Financial instrument and the Norwegian Financial instrument (incl. support for mobility schemes, academic research) for 2009-2014.

Certain limitations to knowledge circulation between national and foreign researchers, however, have been brought about since 2010 by the withdrawal of funds formerly earmarked by the Latvian Council of Science for partly covering costs of individual scientists associated with participation in international conferences and membership fees in international organisations. While this has been to some extent compensated by the funds made available in the EU SF co-funded activity "Support for international collaborative projects in S&T" that can be used not only for drafting proposals for collaborative research projects but also for taking part in scientific conferences, it has left a range of applicants that are not part of the institution-based projects funded under this activity without alternative means of funding.

Efforts are also increasingly being made in addressing the issues of **open access to scientific information** that facilitates free circulation of research outcomes both nationally and internationally. In 2011 a range of evens and discussions were organised by the library of the University of Latvia[8] within the international Open Access week. The debate covered the development of institutional repositories that are only gradually (since 2009-2010) being established by individual institutions in Latvia as well as copyright issues, with many still to be settled.

7. Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world

One of the four strategic tasks set forth by the Guidelines for Development of S&T for 2009-2013 deals with boosting the international competitiveness of scientific activity in Latvia by means of promoting international S&T cooperation (MoES, 2009: 22, 25-26). The action lines identified include promotion of bilateral and multilateral cooperation in the field of scientific research and technological development with EU MSs and other countries; facilitation of Latvian participation in the EU RTD programmes; support for Latvian participation in international organisations and associations of scientific cooperation, technological platforms and other joint international initiatives as well as development of world class RI. The need for internationalising HE and increase the competitiveness of HE and R&D has been emphasised also by the Action plan for necessary reforms in higher education and science for 2010-2012 (MoES, 2010a).

Research collaboration is promoted via participation in EU FP7 as well as other EU-initiated programmes such as COST, EUREKA, EUROSTARS, not to mention the bilateral and multilateral governmental or interdepartmental agreements with **ERA countries** envisaging support for joint research projects and/or mobility of researchers. There are quite a few inter-governmental agreements on institutionalised cooperation in the fields of culture, education, and S&T with such ERA countries as Croatia, Bulgaria, Hungary, Slovenia, Cyprus, Greece, Turkey, France, Portugal, Finland, and Israel. Special note should be made of S&T cooperation within the French-Latvian programme "Osmosis", as well as on the afore-mentioned EEA and Norway grants. Active cooperation is pursued with both

[8] The Library acts as the national contact point within the project OpenAIRE.

Nordic and Baltic countries via the Nordic Council. A growing number of foreign scholarships for Latvian students and researchers are offered by European and non-European countries. Many bilateral and multilateral agreements on exchange visits have been signed by LAS with its partner organisations (Austria, Bulgaria, Germany, United Kingdom, Czech Republic, France, Estonia, Israel, Italy, Lithuania, Norway, Poland, Slovakia, Slovenia, Switzerland, Finland, Hungary, Sweden, Montenegro).

Cooperation in the domain of S&T with **non-ERA** countries is rather intensively pursued by Latvia with a range of intergovernmental agreements signed with such countries as Uzbekistan, China, the Ukraine, Vietnam, India and Egypt. A particularly intensive cooperation is taking place in the framework of the Latvian-Byelorussian cooperation programme in S&T as well as the Mutual Funds for Science Cooperation of Lithuania, Latvia and Taiwan. While most of the bilateral cooperation agreements signed by LAS cover European countries, there are also many signed with the former post-socialist countries outside ERA, e.g., Russia, Byelorussia and the Ukraine, as well as such overseas countries as Canada.

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List of Abbreviations

BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
CSB	Central Statistical Bureau of Latvia
EC	European Commission
ERA	European Research Area
CEE	Central and Eastern Europe
CoM	Cabinet of Ministers of the Republic of Latvia
COST	European Cooperation in Science and Technology
ERA-NET	European Research Area Network
ERDF	European Regional Development Fund
ESA	European Space Agency
ESF	European Social Fund
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU-27	European Union including 27 Member States
FP	European Framework Programme for Research and Technology Development
FP7	7th Framework Programme
FTE	Full-time equivalent
GBAORD	Government Budget Appropriations or Outlays on R&D
GCR	The Global Competitiveness Report
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
HEI	Higher education institutions
HES	Higher education sector
IPR	Intellectual Property rights
IUS	Innovation Union Scoreboard
LAS	Latvian Academy of Sciences
MoE	Ministry of Economics
MoF	Ministry of Finance
MoES	Ministry of Education and Science
NACE	Nomenclature Générale des Activités Économiques dans les Communautés Européennes (French, EU classification system)
NUTS	Nomenclature of territorial units for statistics
PPS	Purchasing power standards
PRO	Public Research Organisations
R&D	Research and development
RI	Research Infrastructures
RTDI	Research Technological Development and Innovation
SF	Structural Funds
SME	Small and Medium Sized Enterprise

S&T	Science and technology

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Abstract

The main objective of the ERAWATCH Annual Country Reports is to characterise and assess the performance of national research systems and related policies in a structured manner that is comparable across countries. EW Country Reports 2011 identify the structural challenges faced by national innovation systems. They further analyse and assess the ability of the policy mix in place to consistently and efficiently tackle these challenges. The annex of the reports gives an overview of the latest national policy efforts towards the enhancement of European Research Area and further assess their efficiency to achieve the targets.

These reports were originally produced in November - December 2011, focusing on policy developments over the previous twelve months. The reports were produced by the ERAWATCH Network under contract to JRC-IPTS. The analytical framework and the structure of the reports have been developed by the Institute for Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) and Directorate General for Research and Innovation with contributions from ERAWATCH Network Asbl.

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